



The Low-Down On Higher Film Speeds

"What developer can I use to increase the speed of my favorite film five or ten times?" We are often asked this question by photographers who anticipate making pictures under extremely poor lighting conditions.

The answer is not simple, for although there are ways of increasing film speeds over normal levels, some sacrifice invariably must be made. Any attempt to force an emulsion to much greater speed than can be obtained from old reliable Kodak Developer D-76 is usually attended by one or more factors affecting quality, such as increased graininess, a high fog level, or a higher gradient.

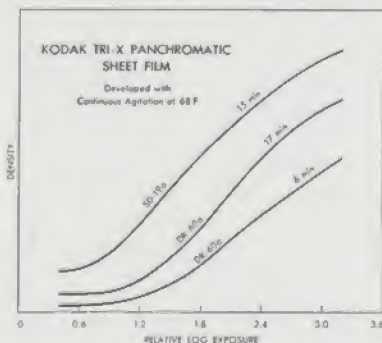
It is important that we define film speeds accurately in order to analyze the results obtained from various special developers and development techniques. Our concept of film speed agrees with that in the introduction to

the American Standard Method for Determining Photographic Speed (American Standard Z38.2.1):

"The photographic speed . . . is to be considered as inversely proportional to the minimum exposure which must be incident upon the negative material, from the scene element of minimum brightness in which detail is visible, in order that a print of excellent quality can be made from the resultant negative."

ASA Exposure Indexes are based on film speeds, but they take into consideration certain conditions which must be reckoned with in determining camera expo- (Continued on next page)

Fig. 1—Normal development time for Kodak Tri-X Panchromatic Film in Kodak Developer DK-60a is 5 to 6 minutes. Maximum speed is obtained in about 17 minutes. Note the real emulsion-speed increase with Kodak Special Developer SD-19a, as measured in the shadow regions.



T. M. Reg. U. S. Pat. Off.

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Fig. 2—A comparison of relative film speeds obtained with Kodak Special Developer SD-19a and Kodak Developer DK-50. From left to right—1/2-, 1/5-, and 1/10-second exposures at f/4.7 on Kodak Super Panchro-Press Film, Type B. The subject illumination was 1 foot-candle. The top row was developed to maximum speed in SD-19a, 20 minutes, continuous agitation, 68 F. The bottom row was developed to maximum speed in a stock solution (undiluted) of DK-50, 8 minutes, continuous agitation, 68 F.

sure—the variables in subject matter, in exposure meter use, in lens and shutter operation, and in the film and its processing. To minimize the danger of underexposure, the exposure index is so chosen that when it is used with a standard exposure meter and all other factors are known and controlled, the resultant exposure on the film will, on the average, be about $2\frac{1}{2}$ times greater than the minimum exposure specified in the definition of speed. This means that on the average, and with normal development, an exposure index $2\frac{1}{2}$ times higher than that recommended would lead to negatives capable of giving prints of highest quality if the proper paper grade is used. Generally, this will mean using one of the higher grades to obtain proper tone separation.

If we can tolerate some loss in print quality, in terms of loss in tone separation

in the shadow or dark portion of the image, we can further reduce exposure by another factor. On the average, we can obtain what most observers would consider a passable print with negative exposures only about $\frac{1}{2}$ those required to give negatives yielding top-quality prints.

Combining these two factors, we find that for many scenes (but not all) we can get just passable prints from negatives exposed about 3 stops (8 times) under the exposures indicated by the recommended indexes. This means that with a film having an index of 100 we can generally get moderately good, but not first-quality results, by using a value of 800.

So far we have assumed that all of the negatives will be given normal development, but that the prints will be made on the most suitable paper. Obviously, for

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exposures so far down on the film curve this generally means the highest grade of paper available. If we increase the negative development, however, we increase the density scale of the negative, and we can print on a softer paper.

This procedure produces little, if any, increase in the actual speed as determined from the relation of shadow tone separation to over-all tone scale. However, it does give negatives of normal density and density scale, and in this respect might be considered as increasing the effective film speed for use with normal paper.

By increasing the development considerably (by increasing the time, or probably better, by using a much more active developer) we may actually get some improvement in the quality of definite underexposures — those beyond the safety factor — but the quality will generally not reach

that obtainable with normal exposures. Because of the greater density in the highlight areas of the image, however, the negative may look fairly normal, so that the forced development may seem to give a great increase in the apparent film speed.

This is the way most high-activity developers work. When used as recommended, they give higher than normal degrees of development, with the resultant increase in highlight density. Similar effects can be obtained with developers of lower activity by prolonging the development time considerably.

We do not recommend forced development for general use. With normal development the film has considerable latitude for overexposure, so that it is not necessary to hit the exposure exactly right for each scene. With forced development the overexposures become

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Kodak Special Developer SD-19a For Maximum Speed from Underexposures

SOLUTION A

Avoirdupois—U. S. Liquid

Metric

0.2% solution of Kodak Anti-Fog No. 2
Hydrazine Dihydrochloride*
Water to make

2½ ounces
96 grains
4 ounces

20.0 cc
1.6 grams
30.0 cc

SOLUTION B (Kodak Developer D-19)

Water, about 125 F (50 C)
Kodak Elon Developing Agent
Kodak Sodium Sulfite, desiccated
Kodak Hydroquinone
Kodak Sodium Carbonate, monohydrated
Kodak Potassium Bromide
Cold water to make

16 ounces
30 grains
3 ounces
115 grains
1¾ ounces
75 grains
32 ounces

500 cc
2.0 grams
90.0 grams
8.0 grams
52.5 grams
5.0 grams
1.0 liter

Just before using, add 1 oz of Solution
A to 1 qt of Solution B (30 cc to 1 liter).

***Caution.** Hydrazine Dihydrochloride is a skin irritant. Avoid contact of the powder or solutions with the skin or eyes. If contact does occur, wash with plenty of water immediately. It is advisable to wear rubber gloves and an apron while working with this formula. This salt is obtainable as Eastman Organic Chemical No. 1117 from laboratory supply houses or on order through the Eastman Organic Chemicals Department, Distillation Products Industries, division of Eastman Kodak Company, 755 Ridge Road West, Rochester 3, New York.

WHAT'S NEW?



*a glimpse of some
recent Kodak products
for better photography*



Kodak Photo-Light Bar—an economical lighting unit for use with amateur motion-picture and still cameras for both black-and-white and color films. The camera is mounted on the horizontal bar and the bar accepts either a Tenite handle or a standard tripod screw. The uprights swivel in for convenient storage and out for shooting. List price: \$8.75.

Kodak Stripping Filter Lacquer—an easy-to-apply brush or spray lacquer for coating windows admitting daylight to interiors being photographed with indoor-type color films. The transmitted light matches the characteristics of the tungsten illuminant normally employed. The lacquer can be stripped clean from glass, metal, or finished wood within a reasonable time after it has been applied. Available in one-gallon bottles. List price: \$10.00.



Kodak De Luxe Spotting and Coloring Brushes—an improved line-up of high-quality sable brushes, available in four sizes. No. 0 is designed for retouching, No. 2 and No. 6 are particularly well-suited to Flexichrome coloring, and No. 8 is recommended for opaquing. List prices: No. 0—60¢, No. 2—80¢, No. 6—\$2.25, and No. 8—\$3.30.

Kodak Anti-Newton Ring Glass—an acid-etched selected glass for preventing Newton's Rings when contact printing or enlarging both black-and-white and color films. Sheets are available in 5 x 7-, 8 x 10-, and 11 x 14-inch sizes for printing frames, and in special sizes for the Kodak Autofocus Enlarger (all 5 x 7 models) and the Eastman Projection Printers No. 1 (5 x 7) and No. 2 (8 x 10). See your Kodak dealer for details and prices.



Kodacraft Miniature Roll-Film Tank—an easy-to-use daylight processing tank for both 20- and 36-exposure 35mm films and 828 film. Made of chip-proof Tenite II, it is convenient to load, use, and pour from. Two rolls can be developed at the same time. Neither the tank nor the aprons are affected by any normal photographic solution. List price: \$2.53.

Did You Know That

- . . . prints are likely to be poorly washed 8 or 9 months out of the year because of low tap-water temperatures? Even this time of year, when the days are getting balmer, the ground remains quite cold and the cold-water tap may run 40 to 50 F. Wash longer from October to June (if 1-hour washing at 70 F is sufficient, at least 1½ hours will be required at 40 F), or better yet, agitate prints for 2 minutes in a 2 percent solution of Kodak Balanced Alkali after fixing and before washing. If the water is in the 60-70 F range, this same treatment can be used to cut washing times in half.
- . . . large areas on lantern slides can be colored quickly and easily by isolation with Kodak Flexichrome Masking Lacquer? Apply the orange-colored easy-to-see Masking Lacquer with a brush around the area to be treated and allow it to dry for a few minutes. Then apply coloring agents in the usual manner — plenty of dye can be used without worrying about “bleeding” — and blot. The dried lacquer is easily removed by placing a strip of Scotch Tape on the surface and “peeling.” In stubborn cases, Kodak Film Cleaner will dissolve remaining portions of the dried lacquer.
- . . . quite a range of brown tones can be obtained with papers of the Kodak Opal type by mixing Kodak Rapid Selenium and Brown Toners in various proportions? Complete instructions are given in the Kodak booklet *Professional Printing With Kodak Photographic Papers* on how to mix and use this rapid single-solution combination. Time and temperature are not critical, the stock solution keeps well, and with proper replenishment one hundred seventy-five 8 x 10-inch prints per gallon can be toned with no shift in hue.
- . . . it's almost impossible to tell one photographic paper from another under safelight illumination unless the stock is of different weight or the type of surface decidedly different? This means lost time and materials in making an actual photographic test when different grades or types of papers become inadvertently mixed. This often happens when the unmarked inner black envelopes are removed and become separated from the labeled outer envelopes. You can save yourself considerable trouble by marking the inner envelope with the paper name, grade, and surface when you first open the package. A silver pencil shows up best on the black paper.
- . . . the quantity of photographic solutions used by the average photographer in his home will in no way harm the operation of a septic-tank system? Many suburban dwellers restrict their darkroom activities for fear of killing off the needed bacteria. Actually, most photographic solutions will support plant life rather than retard growth. We don't recommend that you pour strong acids or wash huge quantities of concentrated chemicals down the drain (you might eat out the pipes), but you have our blessing when it comes to disposing of normal quantities of regular processing solutions in this manner.

Kodak Color Handbook Sections Are Now Available Separately

Formerly supplied only as an integral part of the Kodak Color Handbook, four Kodak Color Data Books are now sold as individual units:

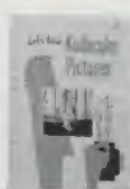
Color As Seen and Photographed provides the background information on color processes and color vision needed by the serious color photographer. It describes in detail how results are influenced by visual effects, and contains many color illustrations. List price: \$1.00.

Color Photography Outdoors has a strong appeal for any photographer who wants top-notch quality in his outdoor color work. Sections on supplementary flash and scenic, illustrative, and architectural photography are included. List price: 50¢.

Color Photography in the Studio discusses light sources, equipment, and lighting and camera techniques for successful studio color photography. Portrait and commercial lighting, make-up, flash technique, and

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New Publications . . .



Let's Take Kodachrome Pictures. This well-illustrated 32-page booklet describes in easy-to-understand language how to take good Kodachrome pictures indoors and out, with flash, flood, and daylight. Comparative lighting effects are illustrated in full color. Simple terms are used to explain how to judge exposure from the lighting, the character of the subject, and the distance. List price: 35¢.



Better Movies in Color. Here's a colorful new aid to having more fun while taking better movies on Kodachrome Film. Dozens of beautiful 4-color pictures, as well as charts, tables, and diagrams, supplement the text story from exposure to projection. All types of situations are covered, both indoors and out. Explanations are simple and graphic. List price: 35¢.

Filter Book Completely Revised

Kodak Wratten Filters for Scientific and Technical Use is the new name for the complete revision of *Wratten Light Filters*, for so long the authoritative source of complete technical information on filters for black-and-white photography, for color photography, and for applications in many fields of science. It contains filter factors, density-transmittance tables, spectrophotometric curves, and data on percent transmittance, luminous transmittance, dominant wavelength,

excitation purity, and stability for the complete line of Kodak Wratten Filters. The concise text discusses forms and types of filters, their standards, the use of specific filters, and the care of filters. Contains 78 pages and over 100 graphs. List price: 75¢.



Brief Notes for the Color Photographer

Color roll-film users should be mighty happy to hear that Kodak Ektachrome Film, Type B, is now available in 620 and 120 rolls. Photographically, it is equivalent to the corresponding sheet film. No filter is required when used with 3200 K lamps; a Kodak Light Balancing Filter No. 81A is needed with photographic flood lamps. Instructions packed with the film suggest filters for flash.

There are two advantages in using Ektachrome Film, Type B, with clear flash lamps rather than Ektachrome Film, Daylight Type, with blue flash lamps. Type B is more than 50 percent faster and, in addition, the quality is better. List price for either 620 or 120 rolls, Daylight Type or Type B: \$1.79 per roll.

Color Handbook (Cont. from page 6)

special problems are thoroughly discussed. List price: 50¢.

Kodak Color Films is an authoritative roundup of the facts on handling, processing, color balance and speed, use of filters, and related subjects. A Data Sheet for each of the Kodak materials used in still color work is included. List price: 50¢.

Of course, if you want the complete guide to taking still pictures in color, the best buy is still the Kodak Color Handbook, which contains all four of these Data Books, plus section dividers and space for four more, a literature list of color publications, and other items. List price: \$4.00.

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so dense they are difficult or impossible to print properly, and the graininess is greatly increased. Forced development should be used only when conditions are such that it is impractical to give normal exposure and the film *must* be underexposed.

When severe underexposure is absolutely necessary, we recommend the use of Kodak Special Developer SD-19a (For Maximum Speed with Underexposures). SD-19a is not new—it was reported to the public almost 8 years ago—but it has been unsurpassed by any other developer or, for that matter, any other method for ability to obtain greatest film speed. Furthermore, as shown in Figure 1, it yields a real speed increase in the toe portion of the characteristic curve, and not just in the highlight densities.

No special processing equipment or technique is required for using SD-19a. Simply add 1 oz (30 cc) of Solution A to 1 qt (1 liter) of Solution B (Kodak Developer D-19) just before using. The best speed increase is obtained by developing for the time required to give a fog value between 0.20 and 0.40. In general, with intermittent agitation in tray or tank, the correct time of development at 68°F is between 12 and 20 minutes.

It should be borne in mind that any attempt to force an emulsion to much greater speed than intended by the manufacturer is usually accompanied by such shortcomings as increased graininess and high fog level. SD-19a is no exception—it *does* cause increased graininess, and the fog level *does* have to be high if any speed increase is to be obtained.

Ultra-Fine Grain Possible With Microdol Modification

Seldom does the amateur require finer grain than that obtained (and at reasonably high emulsion speeds, too!) with the hard-to-beat Kodak Microdol Developer and Kodak Plus-X Film team. There may be times, however, when ultra-fine grain is desirable, even though some loss in film speed is necessary to attain it.

Considerable improvement in graininess can be achieved by adding Kodak Anti-Fog No. 1 to Microdol Developer in the proportion of 2 tablets, or 1 ounce of 0.2 percent stock solution, of Anti-Fog per quart of developer solution. The 0.2 percent solution of Anti-Fog is prepared by dissolving 30 grains of powder in 1 quart

of hot water (2 grams per liter).

Best results are obtained when the film is agitated continuously throughout the development time. When the processing is done in a small tank with continuous agitation during development, the development time should be the same as would be used for straight Microdol Developer with intermittent agitation. The film should be given twice the normal exposure.

If the modified Microdol is to be replenished, add Anti-Fog No. 1 to Microdol Replenisher in the same proportion as described above, and add the replenisher at the normal rate. Capacity and keeping properties are unchanged by this modification.

IS YOUR KODAK REFERENCE HANDBOOK UP TO DATE?

The most recently published *Kodak Reference Handbooks* include the following editions of the various Kodak Data Book sections: *Kodak Lenses, Shutters, and Porta Lenses*—Third Edition, 1948; *Kodak Films*—Fifth Edition, 1951; *Filters and Pola-Screens*—Copyright 1950 (no edition designation); *Kodachrome Films for Miniature and Movie Cameras*—Fifth Edition, 1950; *Kodak Papers*—Fifth Edition, 1951; *Processing and Formulas*—Fourth Edition, 1947 (changes made since 1947 have been incorporated in the First 1951 Printing); *Copying*—Fourth Edition, 1947. Some of the Data Books have later printing dates, such as: "Fourth Edition, 1947; First 1951 Printing." Such printings are not major revisions, although they may differ slightly from previous printings; *Processing and Formulas* and *Copying* are examples. You can bring your Handbook up to date by replacing outdated sections with the latest editions of Kodak Data Books on sale at Kodak dealers.

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